**IMRAD Scribble MSc thesis**

**Introduction**

*LAI3g:* based on GIMMS AVHRR NDVI3g (MODIS LAI used for training neural network)

*LAI-re:* MODIS dataset reanalysis by extending GSI Model (including Plant functional type (PFT) and elevation data; then: forward model FPAR, based on MODIS LAI on FPAR, )

-> both connected to MODIS LAI

-> any other LAI datasets to compare to? Something completely MODIS-independent?

Research Questions:

* How does the LAI-re compare to the LAI3g dataset? Do they differ/how? (any obvious over/under estimations?) \*Comparison LAI3g to MODIS?
* How do climatic controls (temperature, VPD) impact different PFTs/biomes/regions over time?
* (How) do changes in LSP depend on changes in climatic controls?

**Methods**

Problem orientated, not too technical

*Data Preprocessing*

First, all datasets had to be resampled to the same temporal and spatial resolution in order to be comparable. This means resampling the temporal resolution to bimonthly means to fit the LAI3g dataset, and resample the spatial resolution to 0.5 degrees to fit the LAIre dataset.

*Resample*all datasets to 0.5 degree resolution? (LAI-re resolution, coarsest dataset) Check for scaling effects..

*Test sites*: For LAI-Comparison: Landcover type (IGBP, like Zhu,2013)?

***Extraction of LSP indices***

*Smoothing*

In order to extract meaningful LSP indices from the remotely sensed LAI3g dataset, the data had to be smoothed to eliminate outliers due to cloud contamination. This was done using HANTS algorithm developed by de Wit et al. The algorithm works by applying a fast fourier transform to the measured values and extracting first, second and third order wavefunctions. Then it gets transformed back and compared with the original measurement.

*LSP Indices*

The most commonly used indices for LSP are the Start of Season (SoS), End of Season (EoS) and the Growing Season Length (GSL). There are several different ways of defining the onset of a growing season (SoS) (reed et al.). The end of the growing season is usually defined as the point at which the LAI-value goes below the LAI-values set as SoS again (see fig..)

In this thesis, two methods were used to define SoS, the Midpoint method and the Maximum increase method.

***LAI Comparison:***

The two LAI datasets were compared in several different ways. Firstly, a comparison between monthly mean LAI and standard deviation was made to test for systematic differences. Then, the extracted LSP indices were compared and their spatial difference was assessed by creating maps of difference (SOSLAIre-SOSLAI3g)

To compare the two datasets, LSP indices were extracted

- HANTS for smoothing

- Land Cover (p42. Validation good practices, Garonna) to mask water/other non-vegetation lc

- Extract metrics: Max-inflection and/or Midpoint method for LSP

***Changes in Climatic Controls***

Look at controls independently by creating maps, look at trend in time series by defined regions (same as LAI-regions?)

(mainly amount-of-daylight; or maybe test just to make sure?)

How: yearly averages? Monthly? Don’t know yet.

***Comparison***

Correlate changes in LSP-metric (GSL probably (or all 3)) to measured LAI3g; - Extract by PFT/Land Cover? Biome/Region -> seems more appropriate for global trend study.

**Results**

Expected:

*LAI*: generally GSL lengthening, Depending on location of course

*LAI3g-LAIre:* wouldn’t expect too many differences considering they use the same training data. NDVI limitations (3g) might influence it more than climatic controls (re)

*GSI-LAI*: slight rise in temperature, VPD?! No clue what to expect.

Comparison: generally slight rise of GSL with temperature; no trend with radiation (hours daylight stay the same), maybe something with VPD

**Analysis**

**Discussion**